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AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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UREA-SULFA WOUND DRESSING MAY LARGELY SUPPLANT OTHER VETERINARY METHODS

The new method of dry-dressing wounds with urea-sulfa powder, now being used by Army doctors to attain maximum wound sterilization in minimum time, promises to have equal or even greater use in veterinary practice.

Use of urea (carbamide) and sulfa drugs has been characterized by Major Frederic W. Ilfeld of the U. S. Army Medical Corps as an entirely new concept in chemotherapy and as a method that "is much to be preferred" to use of the sulfa drugs alone.

The recommended formula calls for 85 per cent of urea, 13 per cent of sulfanilamide, and 2 per cent of sulfathiazole, which formula gives a maximum of potential solubility.

Commenting on its use in treating livestock, the technical staff of a nationally known veterinary laboratory say that it is not too much to forecast that use of urea-sulfa powder, now produced by several proprietary veterinary medical concerns under their own trade names, will largely supplant most other methods of treatment in veterinary practice. "Here", they add, "even more often than in human medicine, gross contamination and infection hazards are the inflexible penalties of trauma."

Because of the action of the urea in liquefying devitalized and necrotic tissue cells, coupled with the high bacteriostatic action of the sulfonamides, it has been suggested that the urea-sulfa powder should prove far better than the usual formulae for intra-uterine medication of cattle.

More Efficient Than Sulfa Drug Powders Used Alone

Quoting the research veterinarians: "The new Army method consists of surgical debridement, laving the exposed surfaces with physiological saline, painting contiguous skin surfaces with iodine, packing all areas, crevices, and corners of wounds with the urea-sulfa powder, and approximating skin surfaces only, by sutures. All conclusions verify that the conjoined use of a combined urea-sulfa drug powder is immeasurably more efficient than sulfa drug powders used alone."

Lieutenant Colonel Hall G. Holder and Dr. Eaton M. Mackay, who pioneered in research with such mixtures, report that urea has been shown to have many virtues in the treatment of contaminated and infected wounds, enhancing the efficacy of the sulfonamides. They say: "Wound therapy with urea-sulfonamide mixtures is simple and inexpensive; results are excellent."

Studies reported by Holder, Mackay, Ilfeld, and others show that urea is relatively harmless to normal tissues, hastens healing, eliminated odor from

Continued on next page

infected wounds, and is bactericidal chiefly because of its solvent action on dead tissue. It rids wound surfaces of such sulfa-drug inhibitors as pus, debris, and split protein products; and prevents caking of the sulfonamides, thus lessening their foreign body reaction. By increasing solubility, the active effect of the contained sulfanilamide is increased ten times.

Experimental Results

These doctors report that, in a series of 18 compound fractures treated with the powder, 16 healed without additional medication. The two others healed with a slight discharge, but no gross infection. One severe wound was contaminated by manure, as might often happen to farm livestock, but it healed without infection when treated with the mixture.

In experiments at the University of Minnesota, Strakosch and Clark applied sulfathiazole alone to one infected skin lesion, while the corresponding infected area on the opposite side was dressed with urea-sulfathiazole mixtures in wet packs, in ointments, and as a powder. Tests on 28 such patients showed that the "urea-sulfonamide therapy gave much better results than sulfonamides alone." Urea and sulfonamides topically applied to two cases of infections due to sulfonamide-resistant staphylococcus brought about successful healing.

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APPLES RIDE ON MERRY-GO-ROUND

Day after day dozens of luscious big apples of every color and variety are given a merry-go-round ride in the Du Pont Pest Control Research Laboratory at Wilmington, Del., all in the interest of science. Suspended by the stem-end from spoke-like arms leading from a central revolving hub or axis, the apples go round and round, without benefit of music. A cloudlike mist, ejected from the nozzle of a small spray-gun, spreads a film of chemical over the skins of the fruit.

This miniature carousel is only one of hundreds of gadgets, many improvised by laboratory technicians, used by Du Pont research entomologists and plant pathologists in their continuing search for scientific information to use in the age-old fight against insects and fungous diseases.

This particular device determines whether new chemical insecticides and fungicides run off too easily, give splotchy coverings, or make smooth, even, tight films. Other tests establish the relative efficiency of the experimental spray covers against attacks by bugs and fungi.

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"FERMATE" IS "DECISIVELY SUPERIOR" FOR CONTROL OF TOMATO ANTHRACNOSE

A limited quantity of "Fermate" fungicide is being manufactured by Du Pont's Grasselli Chemicals Department for further evaluation by growers. The development and interpretation of new data gained this year, added to previous results of research, such as that reported below, will be very useful as the basis for future recommendations on the use of "Fermate" in the control of certain plant diseases.

"Fermate" fungicide, the new product containing ferric dimethyl dithiocarbamate, was found to be "decisively superior" to the other materials tested for control of anthracnose of tomato fruit in experiments at the Agricultural Experiment Station, Geneva, N. Y.

This information was obtained in two fields where different fungicides were being studied for control of leaf blight. The data on anthracnose were recorded because this disease occurs so sporadically and unexpectedly that it is difficult to plan experiments.

Each fungicide was applied to three plots of 30 plants each. Of the unsprayed plants, 32 per cent were affected with anthracnose, while only 1.4 per cent of those sprayed with "Fermate" showed any signs of disease. Of the other sprays used, one had 27 per cent of the fruit diseased, another 13 per cent, and still another 12 per cent.

"The difference between 32 and 1.4 per cent infection does not adequately express the degree of control, because the 'Fermate'-sprayed fruit had only one or two small lesions per fruit, while many of the unprotected fruit had 20 to 80 lesions," according to the Geneva Station report.

"The tendency for lesions to be small on 'Fermate'-sprayed fruit suggested that the material either had a delayed action on the fungus or else had penetrated into the fruit where it retarded fungous growth. Regardless of the explanation of how 'Fermate' retarded the fungus, it was the only material tested that had this property."

The report says that in another field near Marion in Wayne County, "Fermate", either as a spray or dust, was distinctly superior to all other materials used.

It adds that even though these observations point the way toward developing a control for this serious disease, details will have to be worked out as to the necessary concentration of chemical to use, time and frequency of application, and best methods of applying the fungicide.

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NEW EVIDENCE THAT FERTILIZED PONDS PRODUCE BIGGER, TASTIER, AND GAMER FISH

Fish don't eat ivy; they require plankton.

Plankton is microscopic plant and animal life, and this natural fish-food thrives on chemical plant food applied to lakes and ponds in the form of commercial fertilizer.

Fish that consume fertilized plankton are bigger, tastier, more abundant, and much gamer than those that eat only the usual plankton found in ordinary unfertilized waters.

Fish in a lake or pond, like cattle and other livestock on pasture, grow and thrive in proportion to the available food supply.

So, if someone is seen shoveling a powdery substance over as wide an area of lake or pond as possible, it probably is an enthusiastic fisherman feeding the plankton proper rations of nitrogen, phosphoric acid, and potash. If he does it right, he will stick to the shallow sunny areas, permitting the normal wave action to distribute the plant food throughout the water mass of the immediate vicinity.

Attention to the possibility of producing bigger and better fish through fertilization of ponds came first as the result of a bulletin published two years ago by the Alabama Agricultural Experiment station at Auburn. This report stated that fertilized ponds in Alabama support four or five times as great a weight of fish as unfertilized ponds. Fertilized ponds stocked with 1500 bluegills per acre and fertilized with a complete fertilizer gave yields of 500 to 600 pounds of fish per acre, while the average unfertilized pond, similarly stocked, produced only 40 to 200 pounds. The average fish from the fertilized pond weighed 4 ounces, and from the unfertilized only 1.1 ounces.

McGill University Professor Reports Results of Experiments in Canada

Additional work has been reported from other states and more recently from Canada. Prof. B. W. Taylor of the Department of Game and Fisheries, McGill University, told a convention of the Anglers' Association of Quebec that in experimental plots last year the yield of trout was increased from 4 pounds per acre of water in unfertilized pounds to 120 pounds per acre in a pond fertilized with a 4-8-10 fertilizer at the rate of 50 pounds per million pounds of water. Professor Taylor said this and other experiments indicate a fertilizing rate of 15 to 30 pounds per million pounds of water as most economical. The amount of fertilizer required is determined by a sounding of the lake to get the average depth. The volume and weight of water are calculated. One acre of water one foot deep weighs 2,718,144 pounds. Thus 15 pounds per million equals about 40 pounds of fertilizer per acre-foot of water.

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While fertilizer is added only to the shallow, sunny areas where the plankton thrives best, the amount used is based on total volume or weight of water in the lake.

Ponds or lakes in which the water is changing rapidly cannot be fertilized as economically as those with a relatively constant water content.

Chemists say that since colloidal clay particles in water quickly change soluble phosphate compounds to insoluble ones, lakes or ponds should not be fertilized until after the water has cleared in the spring.

Expert anglers testify that bass and trout in fertilized lakes put up a harder fight than those in unfertilized lakes.

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WINDSHIELD WIPERS AND VACUUM APPARATUS HELP SCIENTISTS

A Canadian entomologist, doing research with insecticides, faced the problem of transferring living grasshoppers from collection cages to control cages for study. He developed a rapid, easy method which provides for suction by a rubber tube connected with the windshield-wiper mechanism of an automobile.

Du Pont scientists use a small vacuum apparatus -- a hair drier in reverse -- to collect flies, moths, and other pests from the test-chamber floor of the Pest Control Research Laboratory at Wilmington, Del.

These insects, of course, are dead, having been killed experimentally by one of the many insecticidal materials under examination.

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KENTUCKY SHEEPMEN OBSERVE "PHENOTHIAZINE WEEK" -- FIRST ON RECORD

Kentucky sheep growers, waging a successful war against internal parasites of sheep, recently focused attention on their chief chemical weapon by observing the first "Phenothiazine Week" ever held anywhere.

The idea, which originated with Prof. Richard C. Miller, Extension sheep specialist at the University of Kentucky, promises to spread to other states in important sheep-raising areas.

Professor Miller has led in the fight against nodular worms and other internal pests that bring emaciation and unthriftiness, loss of sheep intestines for casings and surgical sutures, and that cause many deaths, especially in lambs and young sheep.

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The statewide program included demonstrations, discussions, and reports by sheep owners on their experiences with the drug. The week-long series of meetings was launched with a banquet at the University of Kentucky at Lexington, with spring lamb as the main course.

Sheepmen Say Phenothiazine Is "Best Worm Remover We've Ever Seen"

Professor Miller, participating in the various discussions, pointed out that phenothiazine, "known to chemists as an ideal anthelmintic," has been a boon to Kentucky sheepmen who, he explained, "describe the drug in somewhat earthier language as 'the best worm remover we've ever seen.'" He added that the purpose of "Phenothiazine Week" was to intensify use of the anthelmintic in a well-rounded sheep-management program in the hope of solving the most critical problem now facing sheepmen -- that of saving and growing out to good market weights and finish that part of the lamb crop that cannot be finished for spring or early summer marketing.

Dr. Benjamin Schwartz, chief parasitologist of the U. S. Bureau of Animal Industry, the agency that originally advocated phenothiazine as a vermifuge for livestock, assisted in Kentucky's statewide program. He reported that during the last eight weeks of 1943 enough phenothiazine was delivered to sheepmen in the Lexington vicinity alone to treat 400,000 sheep once.

"Since then the sale of the drug has increased materially, and in some counties having large sheep populations enough has been shipped in recent weeks to treat each sheep twice," he said.

System of Control Rests on Sound Scientific Foundation

Dr. Schwartz added that the Kentucky system, which "rests on a sound scientific foundation and is in line with the recommendation of the U. S. Department of Agriculture," involves pasture rotation and treatment of all ewes with phenothiazine late in the fall, and again shortly after lambing.

"In addition to these treatments, which are designed to remove parasites from the digestive tract, the lambs and ewes have access at all times, from May 1 to September 30, to medicated salt prepared by mixing nine parts of granular salt with one part of phenothiazine," Dr. Schwartz added. "The self-treatment with this medicated salt is designed to prevent reinfestation of the sheep during the warm months of the year when the danger from parasites is greatest."

More than 3,000,000 Pounds of Phenothiazine Used in U. S. Last Year

Carl W. Peterson of the Grasselli Chemicals Department of the Du Pont Company told the banquet audience at Lexington that the first paper on the worm-removing value of this new drug was published by the Bureau of Animal Industry as recently as the latter part of 1938.

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"In the past year, this government agency estimated that more than 3,000,000 pounds of phenothiazine were used in this country alone, with additional quantities in Australia, New Zealand, North Africa, and other parts of the world," he added.

Mr. Peterson pointed out that more of the drug has been used for control of nodular and other gastro-intestinal worms of sheep than any other animal, but that it has also been widely used for control of certain internal parasites in hogs, poultry, cattle and horses.

"As easier methods of administration are developed and more knowledge is obtained on the action of this drug, it is conceivable that some day phenothiazine may be used as widely for other animals as it is at present for sheep and goats," he said.

Phenothiazine Makes Important Contributions to War Effort

The speaker stressed the fact that too much emphasis cannot be placed on what phenothiazine has contributed to the war effort in added foodstuffs, wool and hides, as well as intestines for absorbable surgical sutures. He told of how the Minnesota Agricultural Extension Service, cooperating with local packers, determined the effect of phenothiazine in combating nodular worm, the parasite that makes sheep intestines unfit for sutures. In 1942 about 700 lambs that had not been treated were posted and their intestines examined. Only 5 per cent had intestines that could be used for sutures. Last year an equal number of treated lambs were posted and it was found that 81 per cent had intestines clear of nodules and therefore satisfactory for sutures.

Mr. Peterson reviewed a number of experiments in which phenothiazine was tested. For instance, he told of a comparative test on some 5,000 yearling wethers imported from Texas and pastured during the summer of 1942 just across the state line from Kentucky in southwestern Indiana. Part of them were treated with phenothiazine shortly after their arrival, part were not treated, and others treated only after the mounting death rate had alarmed their owners. At the end of four months pasturing and after proper allowances for death losses, it was found that the animals originally treated averaged more than ten pounds per head greater weight than the untreated. The increased profit resulting from the single treatment was calculated at $1.70 per head, based on weight gain alone. No record was kept of the better quality and greater quantity of wool obtained.

NOTE: A new publication, Extension Leaflet No. 69, "More Profit from Late Lambs," by Richard C. Miller, has just been issued by the University of Kentucky College of Agriculture. A copy of the leaflet will be sent upon request to the Editor, Du Pont "Agricultural News Letter," Wilmington 98, Delaware.

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MILLIONS OF FRUIT TREES TO RECEIVE APPLICATIONS OF HORMONE SPRAYS OR DUSTS

Hundreds of thousands of additional bushels of sound fruit, of better color, size, and storage quality, will be harvested this year -- with smaller picking crews -- because growers plan to inhibit pre-harvest drop by spraying or dusting several millions of apple and pear trees with hormone spray or dust.

For instance, many thousands of acres will be sprayed -- or dusted -- with naphthalene acetic acid, the active ingredient of Du Pont's "Parmone" Concentrated Harvest Spray -- and dust. "Parmone" spray contains four grams of the synthetic plant-hormone substance per pint, each drop of spray containing equal amounts of the growth-regulating chemical.

Since tests show that naphthalene acetic acid dusts will prevent pre-harvest drop as effectively as sprays, and because dusts are much more easily and rapidly applied than sprays, "Parmone" is now also offered as a dust. While most growers are equipped to spray, there are certain regions where dusting is more practical, especially where man power and time are short and growers must reduce the time and number of men required to apply the material.

Growth Regulator Reduces Pre-Harvest Drop of Apples and Pears

Naphthalene acetic acid reduces pre-harvest drop of apples by penetrating the stems within one day to four days after spraying, depending on the temperature. It acts on the abscission layer of cells by retarding certain chemical changes which cause the breakdown of cell walls and the separation of fruit from the trees. This retardation of drop may last as long as two or three weeks on long-stemmed apple varieties which hang down, such as Williams, Transparent, Astrachan, Delicious, Golden Delicious, and Rome Beauty. On short-stemmed varieties, such as McIntosh and York, the effect does not usually last more than nine days and two applications may be needed. These varieties tilt upward so that stems are difficult to hit, and the stem cup does not fill with spray or dust.

In either case, however, the application of "Parmone" results in a considerable increase in total picking of sound, marketable fruit. Because the fruit hangs longer and develops better color, size, and quality, the percentage of culls is greatly reduced, the harvesting period is lengthened, allowing the grower valuable time to gather the crop properly, without undue haste. Losses from untimely winds and jarring the trees during selective or spot picking are also reduced. These factors are often the difference between profit and loss.

"Parmone" retards fruit drop, but does not affect normal ripening. Fruit intended for storage must be picked at the proper stage of maturity to insure its keeping, otherwise it may deteriorate or rot. This applies particularly to Bartlett pears and certain varieties of apples, such as Delicious, Starking, and Golden Delicious.

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A recent issue of "The Oregon Farmer" says that the use of a harvest spray to prevent dropping has become routine practice with many growers in leading apple and pear districts all over the United States. It adds that the cost is small (usually not over 35 cents per tree), and the saving often tremendous.

U.S.D.A. Circular Summarizes Results of Various Investigations

Dr. L. P. Batjer, Senior Pomologist, Division of Fruit and Vegetable Crops and Diseases, U. S. Bureau of Plant Industry, Soils, and Agricultural Engineering in U.S.D.A. Circular, 685, "Harvest Sprays for Control of Fruit Drop," says:

"As the fruits approach picking maturity, they tend to loosen from the spur, and considerable quantities may drop prior to and during the picking operation. Such fruit is badly bruised and, if salvaged at all, has a low value compared with that picked from the tree. This tendency for fruits of many varieties to loosen and drop as they approach proper picking maturity has led growers to advance the picking dates in some instances, with reduced color, reduced size, and poorer storage quality as possible results."

Dr. Batjer also points out that such fruits as Bartlett pears and summer and fall varieties of apples generally are increasing in size and weight at the time they are harvested, and that early or immature harvesting of the crop may appreciably reduce total tonnage. He adds:

"In 1939 it was shown by Gardner, Marth, and Batjer that a group of chemical compounds, generally referred to as growth-regulating substances or hormones, when used as sprays in dilute concentrations, would inhibit abscission and thus effectively retard the pre-harvest drop of apples. After this discovery, proprietary preparations containing the effective substances were made available to fruit growers. In 1940, the first year of commercial use of harvest sprays, approximately 30,000 to 35,000 acres of apples were sprayed; in 1941, approximately 50,000 acres of apples were sprayed; and in 1942, 75,000 to 80,000 acres of apples and pears received harvest-spray applications." Last year more than 100,000 acres were treated, according to estimates based on the sales of harvest-spray materials.

Conclusions

Since, with the rapid expansion in the use of these sprays, results have varied somewhat, Dr. Batjer summarizes the findings of various investigations, which, he says, seem at present to warrant the following conclusions:

"Properly used harvest sprays are very successful with many varieties of apples. Naphthalene acetic acid, naphthalene acetamide, and the sodium salt of naphthalene acetic acid are equally effective in retarding fruit drop.

"Half-strength sprays (5 p.p.m.) are adequate for most summer varieties of apples, and when applied under favorable conditions have given effective control of dropping with many fall varieties. Full-strength sprays (10 p.p.m.)

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have proved desirable and may be necessary for fall varieties under many conditions, but generally the small added benefit would not justify the increased expense.

"Time of application is the most important single factor in the success of harvest sprays, but thorough coverage to reach the fruit stems is also essential. Generally 1 to 3 days are required for these sprays to become effective. Intensity of effect usually reaches a peak in 5 or 6 days and may remain at a high level for 10 days to 3 weeks, varying with such factors as variety, tree condition, and temperature; after this period the effect is rather quickly dissipated. Consequently, as a general rule, the sprays are most effective when applied at the very beginning of the harvest drop. If these sprays are applied too far in advance of drop or are delayed until drop is well under way, little or no effect may be realized.

"If harvest sprays are properly timed and thoroughly applied, a single application will usually give all the protection it is possible to achieve. A second application 4 to 6 days later, however, is recommended for some varieties and under conditions where exact timing is difficult or problematical. By making two applications (the first a few days ahead of the expected drop), the chances of hitting the fruit at the most receptive period are greatly increased.

"The addition of small quantities of summer oil (1 pint to 1 quart per 100 gallons) has generally resulted in slightly increased effectiveness of sprays.

"Harvest sprays are more effective when applied at relatively high temperatures (80° to 85°F.) than when applied under cooler conditions (55° to 60°). A somewhat higher spray concentration might be used on some varieties on days or parts of days when the temperature is relatively low.

"No direct effect of harvest sprays on fruit maturity has been reported. Fruit receiving harvest sprays, however, should not be allowed to remain on the tree too long after the normal harvest period, since it may become overmature.

"Promising results with harvest-spray substances applied in dust form to McIntosh apples have been obtained. The chief advantage of dusting would seem to be the rapidity and uniformity with which applications could be made.

"Results with harvest sprays on pears, particularly the Bartlett and Bosc varieties, have been generally satisfactory. The time of application, spray concentration, and duration of effect are essentially the same as for most varieties of apples.

"Harvest drop of stone fruit is not generally a serious problem. With apricots the use of harvest sprays has reduced the subsequent fruit drop, whereas with peaches no appreciable effect has been obtained."

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"NITROGEN IS VITALLY ESSENTIAL TO WAR EFFORT"

"Nitrogen is vitally essential to the war effort for two reasons: For the production of munitions of different kinds and for the production of food.

"The role of nitrogen in any food-production program is very important. Although nitrogen compounds are present in all cultivated soils, there is seldom enough to promote maximum crop production, and this makes it imperative to use nitrogen compounds as fertilizers.

"It is hardly necessary to state that a serious reduction in the supply of nitrogen fertilizers would imperil both our food- and feed-production programs, and that an abundant supply of nitrogen and other commercial plant foods would lead to the production of greater and more nutritious crops.

Urea Fertilizer Is Especially Important to Farmers

"Urea, now used extensively as a nitrogen fertilizer material.... besides being a source of readily available nitrogen, at a time when it is most desirable that all sources of agricultural nitrogen should be utilized, is especially valuable to the farmer because it is less easily leached from the soil than is nitrogen in the form of nitrates.

"The present circular (reviewed below) discusses the various forms in which urea is obtained commercially, its relation to crop production and to the soil, and its role as a constituent of fertilizers." --Excerpts from U. S. Department of Agriculture Circular No. 679, "Production and Fertilizer Use of Urea."

NEW U.S.D.A CIRCULAR GIVES COMPREHENSIVE INFORMATION ON UREA FERTILIZER

Urea, which contains more nitrogen than does any other solid used as a fertilizer material, has been proved uniformly excellent as a source of that important plant food in the nutrition of plants.

So say government fertilizer authorities in the U. S. Department of Agriculture Circular No. 679, basing their conclusion on results of a wide range of field studies over a period of years with different crops. This circular, called "Production and Fertilizer Use of Urea," is the first comprehensive statement on urea as a fertilizer published in bulletin form by the U. S. Agricultural Research Administration.

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Circular 679 points out that urea not only increases yields, but also improves quality of crops. It reports, for instance, that application of urea to meadows and pastures has been found to increase the protein content of the grass -- a highly desirable contribution to the proper feeding of livestock. It adds that urea is quickly available to crops, some seedlings absorbing and responding to urea and ammonia nitrogen somewhat more rapidly than to nitrate nitrogen.

The publication, by Albert R. Merz, formerly Senior Chemist, Division of Soil and Fertilizer Investigations, and Bailey E. Brown, Senior Biochemist, Division of Fruit and Vegetable Crops and Diseases, Bureau of Plant Industry, Soils, and Agricultural Engineering, at Beltsville, Md., also presents the following pertinent information:

Urea, a white crystalline substance, is classed chemically as an organic compound and is found in nature only as a product of life processes. It was the first organic compound to be made in the laboratory, having been produced by Woehler in 1828. Although first made over 100 years ago, it has been produced on a large scale only in recent years.

Urea is made commercially by combining ammonia and carbon dioxide under high pressure. Thus, in making urea, the carbon dioxide may be considered as serving the purpose, as does sulfuric acid in the manufacture of ammonium sulfate, of forming with ammonia a solid nitrogen-containing product that can be handled with far less difficulty than gaseous or liquid ammonia solutions.

Available Urea Fertilizer Materials Include "Uramon" and UAL

Urea has been marketed in several forms, both solid and liquid. Crystal urea, "Uramon" fertilizer compound, Ureor fertilizer, Calsi-Ureor fertilizer, and Calurea - all solids - have been used. The last three forms were imported from Germany and are not now available.

Crystal urea sets up or cakes and often becomes a hard mass, making it rather difficult to handle as a fertilizer material. "Uramon" fertilizer compound consists essentially of crude urea mixed with conditioning materials which largely prevent caking.

As a liquid, urea has been used in urea-ammonia liquors, commonly called UAL. These liquors consist essentially of solutions of urea in ammonia and water, and are shipped to the fertilizer factories in tank cars. Here, measured quantities of the liquors are added to superphosphate or superphosphate-containing mixtures, the free ammonia of the liquor being rapidly absorbed. This process is known as ammoniation.

Urea Is Excellent Source of Nitrogen

Merz and Brown state: "The Bureau of Plant Industry, Soils, and Agricultural Engineering, in cooperation with different State agricultural experiment stations, has conducted a wide range of field studies to evaluate

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urea as a source of nitrogen for different crops, in comparison with standard nitrogen sources, such as sodium nitrate, ammonium sulfate, and certain of the organic nitrogen sources, including tankage, cottonseed meal, fish scrap, and other organic sources. Urea proved uniformly to be an excellent source of nitrogen for plants."

Elaborating on the use of urea to improve quality, the authors point out that crops grow quickly with an ample supply of available nitrogen and have better color. This applies especially to kale, lettuce, spinach, and other leafy vegetables. Too much nitrogen may, however, produce a crop that will not transport well.

Little Danger of Loss of Urea or Ammonia Through Leaching

Urea dissolves rapidly in soil moisture. The urea is then changed to ammonium bicarbonate, which reacts with the soil, the ammonia nitrogen becoming chemically held by the soil. In this manner, the nitrogen is less subject to leaching and is still available for use by growing crops. The ammonia nitrogen that is not used by crops and not lost is in time converted to nitrate nitrogen, the rate of conversion being dependent on how favorable the conditions are for bacterial action. Since ammonia is held by the soil, there is little danger of loss through leaching until nitrates are produced.

The action of urea nitrogen in the soil minimizes the effect of the fertilizer on the concentration of the soil solution. A given quantity of nitrogen from urea increases the concentration of the soil solution about half as much as would the same quantity of nitrogen from ammonium sulfate, and one-quarter as much as would that from sodium nitrate.

Urea Nitrogen Quickly Available to Crops

Like other soluble nitrogen fertilizers, urea is quickly available to crops. The rapidity of crop response to different forms of nitrogen varies with crop and soil conditions. Some seedlings absorb and respond to urea and ammonia nitrogen somewhat more rapidly than to nitrate nitrogen. Grass and small grains apparently respond with equal rapidity to the three forms of nitrogen. Leafy-vegetable crops respond somewhat more rapidly to nitrate fertilizers.

Urea Produces About Same Degree of Soil Acidity As Cottonseed Meal

Urea nitrogen is slightly acid-forming, producing about the same degree of residual acidity as the nitrogen in cottonseed meal or in dried blood. These materials are about one-third as acidic as ammonium sulfate.

High-Nitrogen Content of Urea Means Substantial Saving in Handling Costs

The authors discuss the proper use of urea fertilizer materials both for direct application to crops and in mixed fertilizers. They point out that urea fertilizers in solid form, such as "Uramon," may be used for all purposes in the same way as the more common nitrogen fertilizers, ammonium sulfate and sodium nitrate. Since "Uramon" contains 42% nitrogen, compared with 20.5% in ammonium

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sulfate and 16% in sodium nitrate, only about half as much "Uramon" as ammonium sulfate and about 40% as much "Uramon" as sodium nitrate need be used to supply equivalent amounts of nitrogen.. This means a substantial saving in all handling costs, as well as convenience in the field.

Suggestions for Use of Urea in Formulating Mixed Fertilizers

The circular gives several fertilizer formulas to illustrate how "Uramon" may be used in mixed fertilizers. Certain general rules that should be observed are pointed out. These suggestions include: Neutralization of the superphosphate; in dry mixtures (non-ammoniated) inclusion of 100 to 200 pounds ammonium sulfate per ton, unless potassium sulfate or substantial quantities of natural organics or conditioning agents are used; avoidance as far as possible of use of low-analysis potash salts, nitrate of soda and wet organics.

Urea-ammonia liquors are used only in the manufacture of mixed fertilizers. The usual practice is to use 65 to 110 pounds of the liquor, equivalent to 30 to 50 pounds of nitrogen, per ton of complete fertilizer, to furnish a portion of the required nitrogen.

Use on Individual Crops and in Special Situations

The use of urea fertilizers on different crops is discussed, and suggestions are made regarding the amounts to use. The authors also give directions for use of urea in special situations, such as in making composts. However, a footnote in the circular explains that specific information concerning the use of urea for fertilizer purposes, including time, rate, and method of application, may be obtained from state agricultural experiment stations, county agents, or the United States Department of Agriculture.

NOTE: A copy of U.S.D.A. Circular No. 679, reviewed above, will be sent on request to the Editor, Du Pont "Agricultural News Letter," Wilmington 98, Delaware.

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IMPROVEMENT IN AMMONIATING SUPERPHOSPHATE IMPORTANT RESULT OF RESEARCH

"Earlier research on ammoniation of superphosphate is now paying dividends."

So says the Agricultural Research Administration in the U. S. Department of Agriculture's monthly publication, "The Agricultural Situation," Vol. 28, No. 4.

The assertion is made in an article, "Fertilizer Research and Crop Production," by Dr. Royall O. E. Davis, of the Division of Fertilizer Research at Beltsville, Md.

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Dr. Davis cites improvement in the ammoniation of superphosphate resulting from introduction of low-cost solutions, such as urea-ammonia liquors, as one of the important results of long-time scientific investigations.

He points out that research has not only helped assure a supply of fertilizers, but has also resulted in the development of better fertilizers and more economical fertilizer practices.

"A search is constantly being made for new forms," he says. "Studies are being made to determine their reactions in mixtures and in the soil, to decrease the cost of production, to determine their fertilizer value by vegetative tests, and to increase their utilization by plants.

"An outstanding recent development in fertilizer preparations is the ammoniation of superphosphate. Research had earlier shown the practicability of treating superphosphate with ammonia or its compounds, but these possibilities could not be realized until abundant supplies of low-cost ammonia became available.

"Synthetic nitrogen-fixation plants have now made anhydrous ammonia or ammonia solutions readily available, and these solutions can be economically shipped in tank cars for use at fertilizer manufacturing plants."

Dr. Davis says that by using solutions of nitrogen compounds, "it is possible to increase the nitrogen content of mixed fertilizers, and to insure to farmers the benefit derived from the use of low-cost nitrogen in synthetic ammonia."

Du Pont Offers Four Grades of Urea-Ammonia Liquors

The Du Pont Company offers to fertilizer manufacturers, under government allocation, four different grades of urea-ammonia liquors, designated UAL-A, UAL-B, UAL-C, and UAL-D.

UAL-A and UAL-B, each containing 45.5 per cent nitrogen, have been available to the trade for several years. UAL-A ante-dated UAL-B by about four years. These two grades, both essentially urea, ammonia, and water, differ in fixed-to-free ammonia ratios, freezing points, and gauge pressures -- all important factors in the ammoniating process. UAL-B has a higher content of urea and a proportionately lower content of free ammonia. The ratio of free ammonia to fixed ammonia (urea ammonia) is 1:0.8 in UAL-B compared with 1:0.5 in UAL-A.

UAL-C and UAL-D Are New

UAL-C and UAL-D, each containing 37 per cent nitrogen, are new. UAL-C is a diluted form of UAL-A, and UAL-D a diluted version of UAL-B.

All of the inorganic nitrogen in all of these solutions is present as free or neutralizing ammonia, which reacts with superphosphate. All of the organic or fixed nitrogen is in the form of urea, which does not enter into the ammoniation reactions, but is precipitated as very fine crystals intimately mixed with the fertilizer.

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NEW WALL CHART SUMMARIZES INFORMATION ON PHENOTHIAZINE AS ANTHELMINTIC

Farmers, veterinarians, and others interested in livestock and poultry henceforth can obtain valuable information on control of internal parasites simply by glancing at an illustrated phenothiazine wall chart, now being distributed by Du Pont. Copy will be sent on request to the Editor, Du Pont "Agricultural News Letter," Wilmington 98, Delaware.

This 19 by 30" poster lists numerous harmful worms that commonly attack sheep, goats, cattle, horses, mules, hogs, chickens, and turkeys. It summarizes outstanding symptoms of infestations, and reviews up-to-date recommendations for use of phenothiazine.

The chart shows that among the parasites that attack sheep and goats are common stomach worms, hookworms, bankrupt worms, large-mouth bowel worms, and nodular worms, all of which can be controlled with phenothiazine administered in a drench, as pellets, with dry feed, or in a salt mixture. Infested sheep and goats, the chart points out, show loss of weight and finish, fail to grow or gain normal weight, have less wool and wool of poorer quality, and often develop anemia.

Cattle infested with twisted stomach worms, lesser stomach worms, hair-like worms, hookworms, Cooperids, or nodular worms, show loss of weight, rough hair coat, swelling under the jaw, and usually develop diarrhea. Phenothiazine is given to cattle with dry feed, as pellets, or in a drench.

Pellets or drench are sometimes used to administer phenothiazine to hogs. However, because hogs are hard to handle, application with dry feed is generally practiced to control nodular worms and large round worms or Ascarids both of which, the chart says, cause loss of weight, failure to grow, and anemia.

The chart says that large strongyles or Palisade worms and small strongyles, both of which cause colic, bowel disturbances, anemia, loss of condition, stamina, and power to work in horses and mules, can be controlled by small repeated doses of phenothiazine over a period of one or more weeks until the total recommended dosage is reached. The drug is given to horses and mules in a drench, in capsules, or with dry feed.

Cecal worms, which carry the organism causing blackhead disease of poultry, cause loss of weight and appetite. The chart recommends one-fourth of a pound of phenothiazine for 250 birds, with as much feed as that number will clean up in an hour or less. Small pellets are also used for chickens and turkeys.

Phenothiazine is distributed through stock-remedy manufacturers to the usual agricultural outlets such as feed, drug, and other retail stores.

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LIFE HISTORY OF THE SCREWWORM

"The primary screwworm fly has four stages in its life cycle; these are the egg, the larva or screwworm, the pupa, and the adult fly. The adult female cements the mass of eggs to the edge of a wound or to the soiled skin below the wound. These hatch in 11 to 21 hours, and the young screwworms invade the wound, feeding close together and forming a pocket in the living flesh. They do not crawl over one another like ordinary blowfly maggots, but feed with the pointed or head end downward and with the tail or blunt end exposed for breathing. The screwworm becomes fully developed within 4 to 10 days, crawls out of the wound, drops to the soil, conceals itself near the surface of the ground, and changes to the pupa or resting stage. This stage usually lasts about 7 days. It may last nearly 2 months during the winter, when the average daily temperatures of the air are approximately 54°F. If the average daily temperatures are lower than 54° and such temperatures prevail for longer periods, they cause the death of the pupae in the soil. When the flies emerge from the pupa cases they mate, and within 5 to 10 days the females are ready to lay eggs. During the warmer months of the year the total cycle may be as short as 18 days, but it usually averages about 24 days." -- U.S.D.A. Circular 162, "Screwworm Control," by W. E. Dove.

NEW BULLETIN GIVES FULL INFORMATION ON SCREWWORMS AND THEIR CONTROL

A simple remedy, made by a chemical formula for a medicinal smear, if used universally throughout the 20 States where screwworms infest the wounds of animals, will save American livestock growers approximately $10,000,000 annually.

This is the estimate of the U. S. Dept. of Agriculture, which points out that saving of large numbers of animals from the depredations of screwworm would also supply more food and other livestock products needed in the war effort.

Increasing amounts of the new material, Smear 62, made by mixing diphenylamine, benzol, turkey red oil, and lamp black according to a formula developed by the U. S. Dept. of Agriculture, are being used this year, particularly in the South where infestations are heaviest.

In the winter and early spring, the distribution of this costly pest is usually confined to Florida, southern Texas, and Mexico. Nearly every year, however, its range extends northward to northern New Mexico, central Kansas, northern Georgia, and central South Carolina, and some summers it includes areas all the way from South Carolina to California with isolated outbreaks as far north as Illinois.

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The importance of the screwworm, which is the maggot stage of the fly Cochliomyia americana C and P., is indicated by the attention being paid to its control by the Bureau of Entomology and Plant Quarantine of the U. S. Agricultural Research Administration. Only recently, W. E. Dove, principal entomologist in charge of the Division of Insects Affecting Man and Animals, in U.S.D.A. Leaflet No. 162, "Screwworm Control," presented detailed information, with numerous drawings, on these harmful maggots.

The government entomologist explains that the primary screwworms breed only in wounds of living animals. When wounds become old and animal tissues die, secondary screwworms or ordinary blowfly maggots may feed on the dead tissues. The life history of the screwworm, described in the box above, is a fascinating series of life-cycle stages, including the egg, the larva or screwworm, the pupa, and the adult fly.

Almost 90 out of every 100 wounds of animals in the Southern States were found infested with primary screwworms. However, all maggot infestations are considered undesirable, and the treatment recommended for screwworms should be given to all external injuries of animals.

The circular points out that before an animal can become infested, it must have an injury on which the screwworm fly can lay its eggs. It discusses particularly wounds in navels of the young, in tick bites, in castration wounds, in dog bites, in snags and scratches, and in other injuries including branding, dehorning, earmarking, shear cuts, boils, injuries due to fighting of rams, eating prickly pears, sore mouth, pinkeye, hornfly bites, hog bites, docking of lambs' tails, breeding injuries, and warts.

Treatment of Screwworm Cases

The following statements on the use of Smear 62, which Mr. Dove calls "a new remedy for the treatment and prevention of screwworm infestations," is quoted from his Circular 162:

"Proper treatments, as described below, kill screwworms without injuring the wounds.

"(1) Swab the wound with cotton to remove pus, blood, and blood serum. Spray benzol (commercial 90 per cent) into the wound with a rubber-bulb syringe to stop the flow of serum and blood.

"(2) Add more benzol and plug the opening of the wound with cotton. The excess benzol is absorbed by the cotton, and fumes are confined to the cavity of the wound. The fumes of benzol kill screwworms when they are breathed by the worms. Do not remove worms or cotton, for they will drop out naturally.

"(3) Cover the cotton plug and wound with dehydrated pine-tar oil (specific gravity 1.065) to keep flies away and to aid healing. Thin applications of pine-tar oil should be made to the wounds every day or two until healing is complete.

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"Mistreatments with coal-tar creosote and strong stock dips delay healing and cause large wounds that furnish breeding places for screwworms for a long time.

"When wounds are difficult to treat or when they occur in valuable animals, the services of a competent veterinarian should be secured.

"A new remedy known as Smear 62 is composed of the following ingredients:

	Parts by weight
Diphenylamine (technical grade)	3½
Benzol (commercial)	3½
Turkey-red oil	1
Lamp black	2

"The diphenylamine is dissolved in the benzol, preferably by placing the two substances together and allowing them to stand 12 to 24 hours. Benzol is highly flammable and should be kept away from flames and lighted cigarettes or cigars. If heat is used to hasten solution, the container holding the benzol and diphenylamine may be placed in a vessel of hot water, the benzol container being left uncorked until the diphenylamine is dissolved. After the diphenylamine is dissolved the turkey-red oil is added and the mixture thoroughly shaken. The lamp black is then stirred in gradually and the mixing continued until the compound attains a smooth, even texture of about the consistency of molasses. It is then ready for use.

"In treating an animal infested with screwworms, the remedy is best applied with a 1-inch paint brush. The material is simply swabbed into the wound, care being taken that it is pushed well into all the pockets made by the maggots and painted around the wound where blood and wound exudate have made the surrounding tissue attractive to flies and susceptible to infestation or to flyblows.

"For protecting uninfested wounds, such as those caused by shear cuts, castrations, dehorning, and docking, it is sufficient to cover the raw tissues and surrounding area thoroughly with a coating of the smear."

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FIVE MAIN CLASSES OF POULTRY FEED

Poultrymen will get the most out of a feed when used for the specific purpose for which it is designed. The current issue of Du Pont's new publication, "Poultry Comment," points out that there are five main classes of poultry feeds: chick starters; broiler mashes or combination starter and broiler mashes; growing mashes; laying mashes or combination laying and breeder mashes; and breeder mashes.

Use of the specific feed for the specific need "will conserve the most critical ingredients, namely proteins and vitamin supplements, and permit more efficient use of grains and their by-products," the paper says. "Even at a higher price, properly designed mash not only saves feed but usually gives a greater return over feed cost."

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THAT'S 22 BILLION POUNDS OF FERTILIZER

American farmers this year are using well over 11,000,000 tons of commercial fertilizer, according to early estimates.

That's a new all-time high, and represents half a million tons more than were used in 1943 and 3,000,000 tons more than in 1940.

Adjustments in analyses of complete fertilizers in different states have been made to insure the best possible use of the available materials supplying nitrogen, phosphoric acid, and potash.

The nitrogen content of many of the available grades has been increased somewhat, indicated supplies of this important plant food being about 35 per cent greater than last year.

While some fertilizer ingredients are available in somewhat larger amounts this year than last, all of them, including such important nitrogen-carrying materials as ammonium sulfate, sodium nitrate, ammonium nitrate, and "Uramon" fertilizer compound, are still on allocation by the War Production Board.

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ARKANSAS SPECIALIST SAYS PHENOTHIAZINE-SALT MIXTURE SAVES TIME AND LABOR

Growers who are using phenothiazine mixed with salt report that this method of dosing sheep on pasture not only controls certain internal parasites such as nodular worms, but also saves both time and labor.

M. W. Muldrow, Arkansas Extension livestock specialist, says that when a mixture of one pound powdered phenothiazine to ten pounds of salt is kept before the flock at all times, about one pound of phenothiazine is required for 30 head of sheep per month.

He says the drug destroys the worm eggs, thus preventing continued infestation, but adds that individual therapeutic doses of phenothiazine may be needed by some sheep if they do not respond to the treatment with the salt mixture, particularly yearlings that are heavily infested in the spring. A dose for an adult sheep is about one ounce, or about one-half ounce for a lamb under 60 pounds.

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